



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	<b>Izbrana poglavja iz fizike</b>
<b>Course title:</b>	<b>Selected topics in physics</b>

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
FIZIKA, 3. stopnja		1. ali 2.	1., 2. ali 4.
PHYSICS, 3 <sup>rd</sup> cycle		1. or 2.	1., 2. or 4.

**Vrsta predmeta / Course type**

Izbirni za vse module

**Univerzitetna koda predmeta / University course code:**

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Mentorstvo Mentorship	Samost. delo Individ. work	ECTS
10	5				165	6

**Nosilec predmeta / Lecturer:**

Marko Robnik

**Jeziki /**

**Languages:**

**Predavanja /**

**Lectures:**

**Vaje / Tutorial:**

slovenski/Slovenian in/and angleški s slovenskim prevodom/English with translation in Slovenian

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**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:**

Ni posebnih zahtev.

**Prerequisites:**

No special prerequisites.

**Vsebina:**

Študenti se udeležijo seminarских predavanj gostujočih znanstvenikov raziskovalcev, kolokvijev, poletnih šol, delavnic ter drugih simpozijev, ki jih organizirata CAMTP in FNM. Študenti se aktivno udeležijo ene izmed navedenih konferenc oz. šol. CAMTP organizira:

- Mednarodne poletne šole in konference »Let's Face Chaos through Nonlinear Dynamics« (vsaka tri leta)

**Content (Syllabus outline):**

Students attend seminar lectures of visiting scientists researchers, colloquia, summer schools, workshops, and other symposia, organized by CAMTP and FNM. Students actively attend one of the proposed summer schools or conferences. CAMTP organizes:

- International Summer Schools and Conferences

<ul style="list-style-type: none"> <li>- European Advanced Studies Conferences (vsako leto)</li> <li>- Japan-Slovenia Seminars on Nonlinear Science (vsako leto)</li> <li>- Božicne simpozije fizikov (vsako leto)</li> <li>- SOCRATES Workshops (v sodelovanju z Univerzo v Marburgu, Nemčija)</li> <li>- Redne raziskovalne seminarje na vseh področjih fizike</li> </ul> <p>Izbiro druge konference, simpozija ali poletne šole potrdi Oddelek za fiziko FNM UM.</p>	<ul style="list-style-type: none"> <li>- »Let's Face Chaos through Nonlinear Dynamics« (every three years)</li> <li>- European Advanced Studies Conferences (every year)</li> <li>- Japan-Slovenia Seminars on Nonlinear Science (every year)</li> <li>- Christmas Symposia of Physicists (every year)</li> <li>- SOCRATES Workshops (in collaboration with University of Marburg)</li> <li>- Regular research seminars in all fields of physics</li> </ul> <p>The selection of other conference, symposium or summerschool should be confirmed by the Department of Physics FNM UM.</p>
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#### Temeljni literatura in viri / Readings:

- 1) Landau, L. D., & Lifshitz, E. M. (1982). *Mechanics*. Butterworth-Heinemann.
- 2) Landau, L. D., & Lifshitz, E. M. (1980). *The classical theory of fields*. Butterworth-Heinemann.
- 3) Landau, L. D., & Lifshitz, E. M. (1981). *Quantum mechanics: Non-relativistic theory*. Butterworth-Heinemann.
- 4) Berestetskii, V. B., Pitaevskii, L. P., & Lifshitz, E. M. (1982). *Quantum electrodynamics*. Butterworth-Heinemann.
- 5) Landau, L. D. (1984). *Statistical physics*. Butterworth-Heinemann.
- 6) Landau, L. D., & Lifshitz, E. M. (1987). *Fluid mechanics*. Butterworth-Heinemann.
- 7) Landau, L. D., Pitaevskii, L. P., Lifshitz, E. M., & Kosevich, A. M. (1986). *Theory of elasticity*. Butterworth-Heinemann.
- 8) Landau, L. D., Pitaevskii, L. P., & Lifshitz, E. M. (1986). *Electrodynamics of continuous media*. Butterworth-Heinemann.
- 9) YAN, Hua, ROBNIK, Marko. Chaos and quantization of the three-particle generic Fermi-Pasta-Ulam-Tsingou model. I. Density of states and spectral statistics. *Physical review*. E. maj 2024, vol. 109, iss. 5, str. 1-17. ISSN 2470-0053.  
<https://journals.aps.org/pre/abstract/10.1103/PhysRevE.109.054210>. [COBISS.SI-ID 196211971]

Dodatna:

Dodatna:

- 10) Članki v revijah Evropskega (EPS) in Ameriškega (APS) fizikalnega združenja, Science, Nature, Scientific American, Physics World, Physik Journal, Physics Today, Nature Physics, News and Reviews in Astronomy and Geophysics / Papers in the journals of European (EPS) and American Physical Society (APS) as well as Science, Nature, Scientific American, Physics World, Physik Journal, Physics Today, Nature Physics, News and Reviews in Astronomy and Geophysics

**Cilji in kompetence:**

- Razumeti osnovne ideje na širokem področju moderne fizike ter povezave z drugimi področji
- Pridobiti dobro razgledanost nad aktualnimi tematikami sodobne fizike

**Objectives and competences:**

- Understanding the basic ideas in the broad domain of modern physics and the links to other fields
- Gaining good overview on the topical themes of modern physics

**Predvideni študijski rezultati:**

Znanje in razumevanje:

- Poglobljeno razumevanje idej, metod in rezultatov sodobne fizike

Prenosljive/ključne spretnosti in drugi atributi:

- sposobnost predstavitve pridobljenih raziskovalnih izsledkov s področja fizike v obliki javnih predstavitev na znanstvenih srečanjih
- poglobljeno razumevanje teoretskih in metodoloških konceptov z različnih področij moderne fizike
- mednarodna komunikativnost v vrhunskem znanstvenem in strokovnem okolju

**Intended learning outcomes:**

Knowledge and understanding:

- Deeper understanding of ideas, methods and results of modern physics

Transferable/Key Skills and other attributes:

- Capability of public presentation of research results from the field of physics to scientific community at the meetings
- Deeper understanding of theoretical and methodological concepts from different areas of modern physics
- Capability of communication in the top-level scientific community

**Metode poučevanja in učenja:**

Predavanja, seminar

**Learning and teaching methods:**

Lectures, seminar

**Načini ocenjevanja:**

- Seminarska naloga
- Ustna predstavitev

Delež (v %) /

Weight (in %)

**Assessment:**

- Seminar paper
- Oral presentation

**Reference nosilca / Lecturer's references:**

WANG, Qian, ROBNIK, Marko. Mixed eigenstates in the Dicke model: statistics and power-law decay of the relative proportion in the semiclassical limit. Physical review. E. 2024, vol. 109, iss. 2, str. 1-11. ISSN 2470-0053. <https://journals.aps.org/pre/abstract/10.1103/PhysRevE.109.024225>, DOI: 10.1103/PhysRevE.109.024225. [COBISS.SI-ID 187759107]

YAN, Hua, ROBNIK, Marko. Chaos and quantization of the three-particle generic Fermi-Pasta-Ulam-Tsingou model. I. Density of states and spectral statistics. Physical review. E. maj 2024, vol.

109, iss. 5, str. 1-17. ISSN 2470-0053.

<https://journals.aps.org/pre/abstract/10.1103/PhysRevE.109.054210>. [COBISS.SI-ID 196211971]

WANG, Qian, ROBNIK, Marko. Statistical properties of the localization measure of chaotic eigenstates in the Dicke model. Physical review. E. 2020, vol. 102, issue 3, str. 0032212-1 - 032212-13, graf. prikazi, tabele. ISSN 2470-0053. DOI: 10.1103/PhysRevE.102.032212. [COBISS.SI-ID 28251907]